Biological and Habitat Data for Fish Collected During Stream Surveys in the Southern (Deh Cho) and Central (Sahtu) Northwest Territories, 2007

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BIOLOGICAL AND HABITAT DATA FOR FISH COLLECTED DURING STREAM SURVEYS IN THE SOUTHERN (DEH CHO) AND CENTRAL (SAHTU) NORTHWEST TERRITORIES, 2007

by

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ABSTRACT

Mochnacz, N.J., S.M. Backhouse, R. Bajno, and J.D. Reist. 2009. Biological and habitat data for fish collected during stream surveys in the southern (Deh Cho) and central (Sahtu) Northwest Territories, 2007. Can. Data Rep. Fish. Aquat. Sci. 1209: vii + 29 p.

Fisheries and habitat surveys were conducted at 14 streams in the Northwest Territories between August 23 and September 4, 2007. Three streams were surveyed in the Deh Cho Region and eleven in the Sahtu region. Streams were electrofished and habitat availability and use were recorded. A total of 483 fish representing ten different species were captured. Slimy sculpin was the most abundant species in this area representing 69.2 % of the total catch, followed by Arctic grayling (17.4 %), bull trout (3.9 %), lake chub (2.3%), northern pike (2.1 %), Dolly Varden (2.1 %), burbot (1.7 %), longnose sucker (0.6 %), lake trout (0.6%), and round whitefish (0.2%). Mean depths ranged from 10.7 cm to 44.2 cm, mean velocities ranged from 0.11 $m \cdot s^{-1}$ to 0.31 $m \cdot s^{-1}$, cobble and pebble was the most common substrate found, and cobble and boulder was the predominant cover observed. Mean water temperature ranged from 6.0 °C in Gibson Creek to 13.3 °C in Smith Creek. The presence of groundwater was detected in most of the streams surveyed in these two areas.

Key Words: Northwest Territories; stream surveys; Arctic; Mackenzie Gas Pipeline; fish habitat; Arctic grayling; Deh Cho Region; Sahtu Settlement Area.

RÉSUMÉ

Mochnacz, N.J., S.M. Backhouse, R. Bajno, et J.D. Reist. 2009. Données sur la biologie et l'habitat des poissons pris lors du relevé des cours d'eau dans la région du sud (Deh Cho) et la région centrale (Sahtu) des Territoires du Nord-Ouest, 2007. Rapp. stat. can. sci. halieut. aquat. 1209 : vii + 29 p.

Des relevés des pêches et des habitats ont été réalisés dans 14 cours d'eau aux Territoires du Nord-Ouest, du 23 août au 4 septembre 2007, dont trois dans la région de Deh Cho et onze dans la région de Sahtu. On s'est livré à la pêche électrique dans les cours d'eau et la disponibilité et l'utilisation de l'habitat ont été enregistrées. Un total de 483 poissons représentant dix espèces différentes ont été capturés. Le chabot visqueux était l'espèce la plus abondante dans la région, représentant 69,2 % de la prise totale, suivi de l'ombre arctique (17,4 %), l'omble à tête plate (3,9 %), le méné de lac (2,3 %), le grand brochet (2,1 %), la Dolly Varden (2,1 %), la lotte (1,7 %), le meunier rouge (0,6 %), le touladi (0,6 %) et le ménomini (0,2 %). Les profondeurs moyennes se trouvaient entre 10,7 cm et 44,2 cm, les vitesses moyennes se trouvaient entre 0,11 $m \cdot s^{-1}$ et 0,31 $m \cdot s^{-1}$, le substrat le plus courant était formé de galets et de cailloux et la couverture prédominante observée était formée de galets et de rochers. Les températures moyennes de l'eau variaient, de 6,0 °C pour le ruisseau Gibson à 13,3 °C pour le ruisseau Smith. On a détecté la présence d'eau souterraine dans la plupart des cours d'eau relevés dans ces deux régions.

Mots-clés : Territoires du Nord-Ouest; recensement des cours d'eau; Arctique; gazoduc du Mackenzie; habitat du poisson; ombre de l'Arctique; Deh Cho; Sahtu.

INTRODUCTION

Hydrocarbon development is moving at a rapid pace in the Northwest Territories. The most significant activity undertaken in the last five years has been work associated with the proposed Mackenzie Gas Pipeline (MGP), which will cross 495 watercourses in the Mackenzie River Valley (Imperial Oil Resources Ventures Limited 2004). Watercourses ranging from ephemeral streams, which provide seasonal fish habitat, to large rivers (e.g., Great Bear River) which provide year round habitat, will be crossed. In response to these proposed development activities, First Nation communities and regulatory government agencies identified data deficiencies for fisheries resources along the proposed pipeline route (Gartner Lee Ltd. 2003; Gartner Lee Ltd. 2004). Studies were initiated in 2004 by Fisheries & Oceans Canada (DFO) to establish pre-construction reference conditions and address data gaps for fish species distributed along the Mackenzie River Valley.

The Mackenzie River and associated tributaries support 34 freshwater and/or anadromous fish species (Hatfield et al. 1972; Dryden et al. 1973, Chang-Kue and Jessop 1991; Sawatzky et al. 2007). Freshwater fish species use the Mackenzie River for feeding and overwintering, and both anadromous and freshwater species use the river as a migration corridor to spawning habitats (Hatfield et al. 1972; Dryden et al. 1973). Fish communities found in the Mackenzie Valley aquatic ecosystem exhibit primarily riverine life histories. Some populations spend part of their annual life cycle in lakes but may use rivers for spawning or as migratory corridors to access specific habitats (e.g., spawning and overwintering habitat). Many of the fish species found along the proposed MGP route are highly sensitive to impacts on their habitat (Stein et al. 1973). Sensitive fish species are those which are not capable of tolerating minimal exploitation and environmental impacts (e.g., habitat loss) without sustaining a decline in productivity at the individual and population level. The following fish species are harvested in commercial, subsistence, and sport fisheries, and are most vulnerable to environmental disturbance: Arctic grayling, *Thymallus arcticus* (Pallas); bull trout, *Salvelinus confluentus* (Suckley); Dolly Varden, *Salvelinus malma* (Walbaum); Arctic cisco, *Coregonus autumnalis* (Pallas); least cisco *Coregonus sardinella* (Valenciennes); inconnu, *Stenodus leucichthys* (Guldenstadt); walleye, *Sander vitreus* (Mitchill); broad whitefish, *Coregonus nasus* (Pallas); lake whitefish, *Coregonus clupeaformis* (Mitchill); round whitefish, *Prosopium cylindraceum* (Pennant); and burbot, *Lota lota* (Linnaeus) (Stein et al. 1973). Pearl dace, *Margariscus margarita* (Cope), brook stickleback, *Culaea inconstans* (Kirtland), and slimy sculpin, *Cottus cognatus* (Richardson) are not as sensitive to perturbations as the above species but are important components of the ecosystem as they are consumed by many of the species identified above (Stein et al. 1973).

The results presented in this report are from the second year of a three-year study started in 2006 (see Mochnacz and Reist 2007). The objectives of this

study are to improve our understanding of the geographic distributions and habitat associations of sensitive fish species in the Mackenzie Valley. Small streams with intermittent flow are the focus of this research, as it is not explicitly clear how they function to support fish populations, or the extent of their contribution as ephemeral habitats within the larger Mackenzie River ecosystem.

MATERIALS AND METHODS

BIOLOGICAL DATA COLLECTION

Field surveys were conducted from August 23 to September 4, 2007. During this period streams sampled in 2006 as well as several new streams were surveyed. Sampling was conducted at three streams in the Deh Cho Region and eleven streams in the Sahtu region (Figure 1). Fish were captured by electrofishing (Smith-Root® Type VII POW backpack electro-fisher), angling, and using set lines. Co-ordinates were taken at each sampling site using a Garmin (GPSMAP 60C) hand-held global positioning system (GPS). For further details on methods see Mochnacz and Reist 2007.

To minimize research impacts on populations, a combination of live- and dead-sampling was conducted.

LIVE SAMPLING

Fork length (mm) was recorded for all sensitive species and sex was determined where possible. Weight (g) was recorded for a sub-sample of live-released fish. Life history type and life stage were assigned based on external characteristics such as size, color, and presence of key external markings (e.g., parr marks). Once biological data were taken, fish were released back into the stream where they were originally captured.

DEAD SAMPLING

A sub-sample of fish were sacrificed to confirm species identity. Fish were either frozen whole or fixed in 10% buffered formalin and preserved in 70% ethanol. Once fish were preserved they were sent to the Freshwater Institute in Winnipeg for processing. Fish were identified to species (McPhail and Lindsey 1970; Scott and Crossman 1973) and fork lengths (mm) and weight (0.1 g) were recorded. Sex, maturity (based on internal examination), and gonad weight (0.1 g) were documented for Arctic grayling, bull trout, burbot, and Dolly Varden. Sexual maturity was determined by internal examination of gonads and each fish was assigned a maturity code (Table 1; McGowan 1992). Fish were aged using whole and sectioned otolith methods (Secor et al. 1992). All char captured were identified to species using a linear discriminant function (LDF) (Haas and McPhail

1991), key morphological characteristics described in field manuals/literature, and genetic analyses (see Mochnacz and Reist 2007).

HABITAT DATA COLLECTION

Habitat information was collected from wadable streams in the area to describe fish habitat use and availability. Habitat was quantified for the stream (i.e., macrohabitat) and at positions within the stream where fish were captured or observed (i.e., microhabitat) (see Goetz 1997).

REACH DELINEATION

Selected streams were stratified into upper, middle, and lower sections based on elevation. Prior knowledge of stream elevation was used to delineate these sections assuming that similar gradients within a stream provide homogenous habitat for fish. In each section one reach, which was 40 mean wetted widths (MWW) in length, was randomly selected. For example, if the stream had a MWW of 3 m, the reach length was 120 m. Each reach was fished using a Smith-Root® backpack electrofisher. Stop nets were placed at the upstream and downstream end of each reach to prevent movements by fish in and out of the sampling area. Co-ordinates were taken at the bottom (i.e., downstream), middle, and top section of each reach.

MACROHABITAT DATA COLLECTION

Macrohabitat was systematically sampled along 20–40 transects at each reach (= station). Simonson et al. (1994) show that a minimum of 13 transects with four data points across each transect should be sampled in a reach to obtain an accurate representation of the habitat present. Transects were spaced two MWW apart and placed perpendicular to water flow. Water depth, water velocity, and dominant substrate and cover types were recorded at four equidistant points across each transect. Depth was measured with a meter stick (nearest 0.5 cm), and velocity was measured at 60% of the water depth using a Marsh-McBirney flow meter (accurate to 0.01 $m \cdot s^{-1}$). Dominant substrate was estimated visually in the surrounding 5 cm for each point using a modified Wentworth scale (Table 2) and cover was estimated visually according to a ranked classification scale (Table 3). At some sites, water temperature was recorded at one meter intervals within the substrate along the river bed using a hand-held DigiSense Thermister Thermometer™ attached to a metal probe. The metal probe was armoured in a steel sheath and driven by hand as far into the river bottom as possible. While on site, ambient river temperature was also recorded at one minute intervals halfway down the water column with Stowaway Tidbit Temperature Loggers™.

The mean water depth, water velocity, and water temperature were determined for each reach, and the mode was determined for substrate and cover types.

MICROHABITAT DATA COLLECTION

Microhabitat was quantified at specific positions in the stream where Arctic grayling, lake chub, and burbot were captured to describe habitat use. Most of the microhabitat data are for Arctic grayling as this was the sensitive species encountered most often during surveys. Each time one of these species was captured or observed a weighted coloured marker was placed in the river at that location. Fork lengths (nearest mm) were recorded for all fish captured. Water depth, water velocity, dominant substrate, and dominant cover were recorded at five points; at the marker, and at 12, 3, 6, and 9 o'clock in a 10 cm diameter clockwise direction around the central point.

RESULTS

Species codes for all fish captured are presented in Table 4. Table 5 shows location information, fishing method, fishing effort, number of fish tagged and released, number of fish dead-sampled, and catch-per-unit-effort. A total of 483 fish representing ten different species were captured. Slimy sculpin was the most abundant species in this area representing 69.2 % of the total catch, followed by Arctic grayling (17.4 %), bull trout (3.9 %), lake chub (2.3 %), northern pike (2.1 %), Dolly Varden (2.1 %), burbot (1.7 %), longnose sucker (0.6 %), lake trout (0.6%) and round whitefish (0.2%). Biological data for lake chub, northern pike, slimy sculpin and longnose sucker are presented in Table 6 and similar data for sensitive species are presented in Table 7.

Each char captured was identified to species based on key qualitative morphological characteristics recognized in the literature (Cavender 1978; Haas and McPhail 1991; Nelson and Paetz 1992; Reist et al. 2002), a linear discriminant function (Haas and McPhail 1991), and three different types of genetic analyses - ribosomal DNA (Baxter et al. 1997), mitochondrial DNA (mtDNA), and growth hormone DNA (Taylor et al. 2001). The final identifications were based on agreement between two or more of the analyses (i.e., morphological, LDF, DNA analyses) (Table 8).

Mean water depths ranged from 10.7 cm to 44.2 cm, mean water velocities ranged from 0.11 $m \cdot s^{-1}$ to 0.31 $m \cdot s^{-1}$, cobble and pebble were the most common substrate found, and cobble and boulder were the predominant cover (Table 9). Mean temperatures ranged from 6.0 °C in Gibson Creek to 13.3 °C in Smith Creek (Table 9). Groundwater contributed to base flow in all of the streams surveyed and influenced surface water temperature throughout the day. Groundwater was located using water temperature measurements in Canyon Creek, Smith Creek, Francis Creek, White Sand Creek, Gibson Creek, and the Gayna River. These groundwater sources prevent these streams from completely freezing to the bottom in local areas during the winter providing suitable habitat for fish.

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Table 1. Sexual maturity codes assigned to fish during the study (McGowan 1992).

Maturity State	Male – 1	Female – 2
Immature	06 – testes long and thin, tubular and scalloped shape, up to full body length, putty-like firmness	01 – ovaries granular, hard and triangular, up to full length of body cavity, membrane full, eggs distinguishable
Mature	07 – current year spawner, testes large and lobate, white to purplish in color, centers may be fluid, milt not expelled by pressure	02 – current year spawner, ovary fills body cavity, eggs near full size but not loose and not expelled by pressure
Ripe	08 – testes full size, white and lobate, milt expelled by slight penetration	03 – ovaries greatly extended and fill body cavity, eggs full size and transparent, expelled by slight pressure
Spent	09 – spawning complete, testes flaccid with some milt, blood vessels obvious, testes violet-pink in colour	04 – spawning complete, ovaries ruptured and flaccid, developing oocytes, visible, some eggs retained in body cavity
Resting	10 – testes tubular, less lobate, healed from spawning, no fluid in center, usually full length of body, mottled and purpulish in colour	05 – ovary 40 – 50% of body cavity volume, membrane thin and semi-transparent, healed from spawning, developing oocytes apparent with few atretic eggs, some eggs may be retained in body cavity
Unknown (virgin)	00 – cannot be sexed, gonads long or short and thin, transparent or translucent	
Unknown (non-virgin)	11 – resting fish, has spawned but gonads regenerated, or sexing not possible	

Table 2. Modified Wentworth classification of substrate types by size used for stream surveys in 2007 (Cummins 1962).

Code	Particle size range (mm)	Substrate definition
5	> 256	Boulder
4	64 - 255	Cobble
3	16 - 63	Pebble
2	2 - 15	Gravel
1	0.06 - 1	Sand
0	< 0.059	Silt

Table 3. Cover classification defining types used for stream surveys in 2007 (after Sexauer and James 1997).

Code	Type or size range	Cover definition
1	aquatic vegetation	Submerged vegetation
2	riparian vegetation	Overhanging vegetation
3	water column depth	Depth
4	water turbulence	Turbulence
5	65 - 255 mm	Cobble
6	256+ mm	Boulder
7	> 30 cm diameter	Large wood
8	< 30 cm diameter	Small wood
9	stable bank, undercut	Undercut bank
10	none of the above are applicable	No cover

Table 4. Fish species captured during stream surveys in 2007.

Common Name	Scientific Name	Abbreviation
Arctic grayling	*Thymallus arcticus*	ARGR
Burbot	*Lota lota*	BUBT
Bull trout	*Salvelinus confluentus*	BLTR
Dolly Varden char	*Salvelinus malma*	DVCH
Lake chub	*Couesius plumbeus*	LKCH
Longnose sucker	*Catostomus catostomus*	LNSC
Northern pike	*Esox lucius*	NRPK
Slimy sculpin	*Cottus cognatus*	SLSC
Round Whitefish	*Prosopium cylindraceum*	RNWH
Lake Trout	*Salvelinus namaycush*	LKTR

Table 5. Fish inventory data for all species captured during backpack electrofishing and angling surveys in 2007. Note: CPUE = catch-per-unit-effort.

Capture location	Site (reach)	Date M/D/Y	Method	Effort (min)	Species	No. of fish	No. of fish released	No. of fish dead-sampled	CPUE fish/100 min
Smith Creek Reach 1	1	8/24/07	EF	-	ARGR	2	1	1	-
63° 10.496' N, 123° 20.246' W					BRBT	3	1	2	-
					SLSC	9	0	9	-
Total						**14**	**2**	**12**	-
Smith Creek Reach 2	2	8/24/07	EF	-	ARGR	6	0	6	-
63° 10.893' N, 123° 20.199' W					BRBT	5	0	5	-
					NRPK	3	3	0	-
					SLSC	27	15	12	-
					LNSK	1	0	1	-
Total						**42**	**18**	**24**	-
Hodgson Creek Reach 1	3	8/23/07	EF	-	ARGR	6	0	6	-
63° 20.337' N, 123° 25.889' W					SLSC	2	0	2	-
Total						**8**	**0**	**8**	-
White Sand Creek Reach 1	4	8/23/07	EF	-	ARGR	1	0	1	-
63° 37.215' N, 123° 35.840' W					SLSC	5	2	3	-
Total						**6**	**2**	**4**	-
Canyon Creek Reach 1	5	8/27/07	EF	-	ARGR	9	0	9	-
65° 15.013' N, 126° 28.876' W					SLSC	53	48	5	-
Total						**62**	**48**	**14**	-
Canyon Creek Reach 2	6	8/27/07	EF	-	ARGR	5	0	5	-
65° 15.219' N, 126°28.258' W					SLSC	50	50	0	-
Total						**55**	**50**	**5**	-

Capture location	Site (reach)	Date M/D/Y	Method	Effort (min)	Species	No. of fish	No. of fish released	No. of fish dead-sampled	CPUE fish/100 min
Jungle Ridge Creek Reach 1	7	8/28/07	EF	-	-	-	-	-	-
65° 02.887' N, 126° 01.238' W									
Total						**0**	**0**	**0**	-
Gibson Creek Reach 1	8	8/29/07	EF	-	ARGR	1	0	1	-
65° 41.989' N, 127° 53.719' W					NRPK	1	0	1	-
					SLSC	15	10	5	-
Total						**17**	**10**	**7**	-
Jackfish Creek Reach 1	9	8/29/07	EF	-	ARGR	1	0	1	-
66° 15.607' N, 128° 36.186' W					LKCH	2	0	2	-
					LNSC	2	0	2	-
					NRPK	6	6	0	-
					SLSC	16	16	0	-
Total						**27**	**22**	**5**	-
Carcajou River Reach 1	10	09/01/07	ANG	120	BLTR	1	0	1	0.008
64° 42.024' N, 126° 57.895' W			SL	495	-	-	-	-	0.000
Total						**1**	**0**	**1**	**0.002**
Carcajou River Reach 2	11	09/01/07	ANG	240	BLTR	3	0	3	0.013
64° 37.730' N, 127° 13.168' W					ARGR	2	2	0	0.008
Total						**5**	**2**	**3**	**0.021**
Little Keele River Reach 1	12	09/01/07	ANG	60	BLTR	0	0	0	0.000
64° 42.566' N, 126° 58.207' W			SL	495	BLTR	1	0	1	0.002
Total						**1**	**0**	**1**	**0.002**
Moose Horn River Reach 1	13	09/01/07	ANG	90	-	0	0	0	0.000
63° 36.603' N, 126° 50.304' W			SL	90	-	-	-	-	0.000

Capture location	Site (reach)	Date M/D/Y	Method	Effort (min)	Species	No. of fish	No. of fish released	No. of fish dead-sampled	CPUE fish/100 min
Moose Horn River Reach 1 - Cont.									
Total						**0**	**0**	**0**	**0.000**
Trout Creek Reach 1	14	09/01/07	ANG	90	BLTR	2	0	2	0.022
64° 12.514' N, 128° 15.624' W									
Total						**2**	**0**	**2**	**0.022**
Unnamed Tributary of the Redstone River Reach 1	15	09/01/07	ANG	180	BLTR	2	0	2	0.011
63° 39.001' N, 126° 23.691' W									
Total						**2**	**0**	**2**	**0.011**
Gayna River Reach 1	16	09/03/07	ANG	960	DVCH	9	6	3	0.009
65° 17.464' N, 129° 21.481' W									
Total						**9**	**6**	**3**	**0.009**
Gayna River Reach 2	17	09/03/07	ANG	240	BLTR	1	0	1	0.004
65° 17.861' N, 129° 21.376' W					DVCH	1	0	1	0.004
					ARGR	24	19	5	0.100
Total						**26**	**19**	**7**	**0.108**
Elliot Creek Reach 1	18	08/30/07	EF	-	LKCH	5	0	5	-
65° 31.435' N, 127° 37.123' W					SLSC	81	76	5	-
Total						**86**	**76**	**10**	**-**
Elliot Creek Reach 2	19	08/30/07	EF	-	LKCH	4	0	4	-
65° 31.357' N, 127° 37.090' W					SLSC	75	75	0	-
Total						**79**	**75**	**4**	**-**

Capture location	Site (reach)	Date M/D/Y	Method	Effort (min)	Species	No. of fish	No. of fish released	No. of fish dead-sampled	CPUE fish/100 min
Natla River (Ram Head Outfitters) 62° 58.897' N, 129° 05.595' W	20	08/14/07	ANG	NA	LKTR	1	1	0	-
Total						**1**	**1**	**0**	-
O'Grady Lake (Right Outlet) 62° 59.315' N, 129° 04.033' W	21	08/14/07	ANG	NA	ARGR	5	5	0	-
Total						**5**	**5**	**0**	-
O'Grady Lake (Left Outlet)	22	08/14/07	ANG	60	ARGR	13	13	0	0.217
62° 59.791' N, 129° 03.676' W					LKTR	1	1	0	0.017
Total						**14**	**14**	**0**	0.233
O'Grady Lake (Upper) 62° 59.625' N, 129° 04.712' W	23	08/15/07	ANG	NA	LKTR	1	1	0	-
Total						**1**	**1**	**0**	-
Natla River (Lower O'Grady L. Outlet)	24	08/16/07	ANG	330	ARGR	9	9	0	0.027
62° 00.268' N, 128° 59.680' W					BLTR	9	0	9	0.027
					RNWH	1	0	1	0.003
Total						**19**	**9**	**10**	0.058
Dodo Creek at Salt Flats 64° 51.065' N, 127° 14.474' W	25	08/17/07	NA	NA	SLSC	1	0	1	-
Total						**1**	**0**	**1**	-

Table 6. Biological data for both live- and dead-sampled lake chub, northern pike, slimy sculpin, and longnose sucker captured in streams during the summer 2007. Note: Fish Fate - DS = dead sampled, LR = live release. Total numbers (No.) of individuals equals 176.

Location	Site (reach)	Date M/D/Y	No.	Species	FL (mm)	Wt (g)	Fish Fate
Smith Creek Reach 1	1	08/24/07	1	SLSC	81	6.7	DS
63° 10.496' N, 123° 20.246' W			2	SLSC	61	2.2	DS
			3	SLSC	67	3.3	DS
			4	SLSC	62	2.7	DS
			5	SLSC	67	3.6	DS
			6	SLSC	59	2.3	DS
			7	SLSC	63	2.3	DS
			8	SLSC	52	1.5	DS
			9	SLSC	37	0.4	DS
Smith Creek Reach 2	2	08/24/07	10	NRPK	164	-	LR
63° 10.893' N, 123° 20.199' W			11	NRPK	148	-	LR
			12	NRPK	160	-	LR
			13	SLSC	65	2.9	DS
			14	SLSC	61	2.5	DS
			15	SLSC	77	6.0	DS
			16	SLSC	57	1.7	DS
			17	SLSC	46	1.0	DS
			18	SLSC	73	4.9	DS
			19	SLSC	75	5.0	DS
			20	SLSC	56	2.1	DS
			21	SLSC	48	1.2	DS
			22	SLSC	48	1.3	DS
			23	SLSC	65	3.6	DS
			24	SLSC	80	6.5	DS
			25	SLSC	51	-	LR
			26	SLSC	75	-	LR
			27	SLSC	65	-	LR
			28	SLSC	61	-	LR
			29	SLSC	71	-	LR
			30	SLSC	51	-	LR
			31	SLSC	55	-	LR
			32	SLSC	55	-	LR
			33	SLSC	55	-	LR
			34	SLSC	56	-	LR
			35	SLSC	46	-	LR
			36	SLSC	47	-	LR
			37	SLSC	40	-	LR
			38	SLSC	45	-	LR

Location	Site (reach)	Date M/D/Y	No.	Species	FL (mm)	Wt (g)	Fish Fate
Smith Creek Reach 2 (continued).			39	SLSC	80	-	LR
			40	LNSK	69	3.4	DS
Hodgson Creek Reach 1 63° 20.337' N, 123° 25.889' W	3	08/23/07	41	SLSC	52	1.0	DS
			42	SLSC	67	3.0	DS
White Sand Creek Reach 1 63° 37.215' N, 123° 35.840' W	4	08/23/07	43	SLSC	61	2.1	DS
			44	SLSC	51	1.1	DS
			45	SLSC	50	1.1	DS
			46	SLSC	63	2.1	LR
			47	SLSC	52	1.9	LR
Canyon Creek Reach 1 65° 15.013' N, 126° 28.876' W	5	08/27/07	48	SLSC	72	-	LR
			49	SLSC	60	-	LR
			50	SLSC	67	-	LR
			51	SLSC	49	-	LR
			52	SLSC	42	-	LR
			53	SLSC	64	-	LR
			54	SLSC	68	-	LR
			55	SLSC	53	-	LR
			56	SLSC	46	-	LR
			57	SLSC	62	-	LR
			58	SLSC	64	-	LR
			59	SLSC	64	-	LR
			60	SLSC	64	-	LR
			61	SLSC	66	-	LR
			62	SLSC	63	-	LR
			63	SLSC	58	-	LR
			64	SLSC	58	-	LR
			65	SLSC	50	-	LR
			66	SLSC	48	-	LR
			67	SLSC	60	-	LR
			68	SLSC	52	-	LR
			69	SLSC	64	-	LR
			70	SLSC	66	-	LR
			71	SLSC	62	-	LR
			72	SLSC	62	-	LR
			73	SLSC	62	-	LR
			74	SLSC	50	-	LR
			75	SLSC	53	-	LR
			76	SLSC	62	-	LR
			77	SLSC	55	-	LR
			78	SLSC	67	-	LR
			79	SLSC	52	-	LR
			80	SLSC	62	-	LR

Location	Site (reach)	Date M/D/Y	No.	Species	FL (mm)	Wt (g)	Fish Fate
Canyon Creek Reach 1 (continued).			81	SLSC	58	-	LR
			82	SLSC	57	-	LR
			83	SLSC	68	-	LR
			84	SLSC	45	-	LR
			85	SLSC	68	-	LR
			86	SLSC	64	-	LR
			87	SLSC	27	-	LR
			88	SLSC	61	-	LR
			89	SLSC	43	-	LR
			90	SLSC	69	-	LR
			91	SLSC	60	-	LR
			92	SLSC	52	-	LR
			93	SLSC	54	-	LR
			94	SLSC	58	-	LR
			95	SLSC	55	-	LR
			96	SLSC	67	2.6	DS
			97	SLSC	66	2.5	DS
			98	SLSC	59	1.5	DS
			99	SLSC	63	2.1	DS
			100	SLSC	42	0.6	DS
Canyon Creek Reach 2 65° 15.219' N, 126° 28.258' W	6	08/27/07	101	SLSC	-	-	LR
Gibson Creek Reach 1 65° 41.989' N, 127° 53.719' W	8	08/29/07	102	NRPK	316	-	LR
			103	SLSC	50	1.2	DS
			104	SLSC	39	0.6	DS
			105	SLSC	59	1.5	DS
			106	SLSC	57	1.7	DS
			107	SLSC	55	1.6	DS
			108	SLSC	-	-	LR
Jackfish Creek Reach 1 66° 15.607' N, 128° 36.186' W	9	08/29/07	109	LKCH	93	7.4	DS
			110	LKCH	94	9.2	DS
			111	LNSC	80	4.2	DS
			112	LNSC	72	3.3	DS
			113	NRPK	139	-	LR
			114	NRPK	116	-	LR
			115	NRPK	104	-	LR
			116	NRPK	138	-	LR
			117	NRPK	134	-	LR
			118	NRPK	106	-	LR
			119	SLSC	82	-	LR
			120	SLSC	84	-	LR
			121	SLSC	81	-	LR

Location	Site (reach)	Date M/D/Y	No.	Species	FL (mm)	Wt (g)	Fish Fate
Jackfish Creek Reach 1 (continued).			122	SLSC	46	-	LR
			123	SLSC	45	-	LR
			124	SLSC	44	-	LR
			125	SLSC	43	-	LR
			126	SLSC	45	-	LR
			127	SLSC	41	-	LR
			128	SLSC	42	-	LR
			129	SLSC	40	-	LR
			130	SLSC	39	-	LR
			131	SLSC	43	-	LR
			132	SLSC	44	-	LR
			133	SLSC	43	-	LR
			134	SLSC	71	-	LR
Elliot Creek Reach 1 65° 31.435' N, 127° 37.123' W	18	08/30/07	135	LKCH	84	8.4	DS
			136	LKCH	88	8.5	DS
			137	LKCH	76	6.1	DS
			138	LKCH	65	3.2	DS
			139	LKCH	80	5.7	DS
			140	SLSC	60	1.9	DS
			141	SLSC	34	0.3	DS
			142	SLSC	73	4.4	DS
			143	SLSC	74	3.8	DS
			144	SLSC	51	1.2	DS
			145	SLSC	43	0.6	LR
			146	SLSC	60	2.7	LR
			147	SLSC	49	1.0	LR
			148	SLSC	47	0.8	LR
			149	SLSC	55	1.4	LR
			150	SLSC	68	2.7	LR
			151	SLSC	44	0.8	LR
			152	SLSC	60	2.1	LR
			153	SLSC	65	2.9	LR
			154	SLSC	54	1.1	LR
			155	SLSC	50	1.2	LR
			156	SLSC	72	3.1	LR
			157	SLSC	50	1.1	LR
			158	SLSC	36	0.5	LR
			159	SLSC	49	1.1	LR
			160	SLSC	55	1.5	LR
			161	SLSC	70	2.3	LR
			162	SLSC	50	1.0	LR
			163	SLSC	40	0.5	LR
			164	SLSC	63	2.9	LR
			165	SLSC	62	2.1	LR

Location	Site (reach)	Date M/D/Y	No.	Species	FL (mm)	Wt (g)	Fish Fate
Elliot Creek Reach 1 (continued).			166	SLSC	43	0.6	LR
			167	SLSC	54	1.4	LR
			168	SLSC	46	0.8	LR
			169	SLSC	41	0.6	LR
Elliot Creek Reach 2 65° 31.357' N, 127° 37.090' W	19	08/30/07	170	LKCH	81	6.5	DS
			171	LKCH	69	3.8	DS
			172	LKCH	79	4.9	DS
			173	LKCH	81	6.9	DS
			174	SLSC	75	-	LR
			175	SLSC	13	-	LR
Dodo Creek at Salt Flats 64° 51.065' N, 127° 14.474' W	22	08/17/07	176	SLSC	51	0.9	DS

Table 7. Biological data collected during electrofishing surveys from both live- and dead-sampled Arctic grayling, burbot, bull trout, and Dolly Varden captured in streams during the summer 2007. Notes: 1. Five digit codes (e.g., 47257) are ID numbers assigned to dead-sampled fish at the Department of Fisheries and Oceans, Wpg, 2. Maturity (see methods for codes), 3. A = adult, J = Juvenile, YOY = young-of-the-year, 4. DS = dead-sampled, LR = live release. Total numbers (No.) of individuals equals 125.

Location	Site No.	Date M/D/Y	No.	Fish ID[1]	Species	FL (mm)	Wt (g)	Sex	Mat.[2]	Age (yr +)	Life Stage[3]	Fish Fate
Smith Creek Reach 1	1	08/24/07	1	-	ARGR	201	-	-	-	-	-	LR
63° 10.496' N, 123° 20.246' W			2	-	BRBT	315	-	-	-	-	-	LR
			3	-	ARGR	139	26.5	-	-	2	J	DS
			4	-	BRBT	145	19.6	-	-	2	J	DS
			5	-	BRBT	68	2.1	-	-	1	J	DS
Smith Creek Reach 2	2	08/24/07	6	-	ARGR	166	52.6	-	-	4	J	DS
63° 10.893' N, 123° 20.199' W			7	-	ARGR	78	4.8	-	-	1	J	DS
			8	-	ARGR	54	1.4	-	-	1	J	DS
			9	-	ARGR	53	1.5	-	-	1	J	DS
			10	-	BRBT	139	13.8	-	-	2	J	DS
			11	-	BRBT	116	9.5	-	-	2	J	DS
			12	-	ARGR	79	4.7	-	-	1	J	DS
			13	-	ARGR	53	1.5	-	-	-	J	DS
			14	-	BRBT	176	29.4	-	-	4	-	DS
			15	-	BRBT	109	7.2	-	-	2	J	DS
			16	-	BRBT	109	6.3	-	-	2	J	DS
Hodgson Creek Reach 1	3	08/23/07	17	-	ARGR	65	3.3	-	-	1	J	DS
63° 20.337' N, 123° 25.889' W			18	-	ARGR	145	36.5	-	-	3	J	DS
			19	-	ARGR	146	36.1	-	-	3	J	DS
			20	-	ARGR	125	21.9	-	-	3	J	DS
			21	-	ARGR	150	38.7	-	-	4	-	DS
			22	-	ARGR	131	26.5	-	-	4	-	DS

Location	Site No.	Date M/D/Y	No.	Fish ID[1]	Species	FL (mm)	Wt (g)	Sex	Mat.[2]	Age (yr +)	Life Stage[3]	Fish Fate
White Sand Creek Reach 1 63° 37.215' N, 123° 35.840' W	4	08/23/07	23	-	ARGR	208	85.6	-	-	4	-	DS
Canyon Creek Reach 1 65° 15.013' N, 126° 28.876' W	5	08/27/07	24	-	ARGR	82	4.7	-	-	1	J	DS
			25	-	ARGR	76	3.2	-	-	1	J	DS
			26	-	ARGR	74	3.4	-	-	1	J	DS
			27	-	ARGR	72	3.1	-	-	1	J	DS
			28	-	ARGR	63	1.8	-	-	0	-	DS
			29	-	ARGR	116	14.8	-	-	3	J	DS
			30	-	ARGR	104	10.0	-	-	1	J	DS
			31	-	ARGR	133	23.5	-	-	2	J	DS
			32	-	ARGR	152	34.5	-	-	4	-	DS
Canyon Creek Reach 2 65° 15.219' N, 126° 28.258' W	6	08/27/07	33	-	ARGR	72	3.5	-	-	1	J	DS
			34	-	ARGR	167	48.8	-	-	4	-	DS
			35	-	ARGR	68	2.6	-	-	-	-	DS
			36	-	ARGR	75	3.9	-	-	1	J	DS
			37	-	ARGR	87	5.8	-	-	1	J	DS
Gibson Creek Reach 1 65° 41.989' N, 127° 53.719' W	8	08/29/07	38	-	ARGR	60	1.8	-	-	1	J	DS
Jackfish Creek Reach 1 66° 15.607' N, 128° 36.186' W	9	08/29/07	39	-	ARGR	87	6.1	-	-	1	J	DS
Carcajou River Reach 1 64° 42.024' N, 126° 57.895' W	10	09/01/2007	40	51187	BLTR	588	1810.0	M	06	14	-	DS
Carcajou River Reach 2 64° 37.730' N, 127° 13.168' W	11	09/01/2007	41	51183	BLTR	449	1070.0	F	01	6	J	DS
			42	51184	BLTR	495	1180.0	M	06	10	-	DS

Location	Site No.	Date M/D/Y	No.	Fish ID[1]	Species	FL (mm)	Wt (g)	Sex	Mat.[2]	Age (yr +)	Life Stage[3]	Fish Fate
Carcajou River Reach 2			43	51185	BLTR	547	1560.0	M	06	13	-	DS
(continued).			44	-	ARGR	392	-	-	-	-	-	LR
			45	-	ARGR	385	-	-	-	-	-	LR
Little Keele River Reach 1	12	09/01/2007	46	51186	BLTR	573	1670.0	M	06	12	-	DS
64° 42.566' N, 126° 58.207' W												
Trout Creek Reach 1	14	09/01/2007	47	51190	BLTR	546	1630.0	F	05	14	A	DS
64° 11.691' N, 126° 14.285' W			48	51192	BLTR	392	780.0	M	06	9	-	DS
Unnamed Tributary - Redstone River	15	09/01/2007	49	51188	BLTR	549	1740.0	M	10	16	A	DS
63° 39.001' N, 126° 23.691' W			50	51189	BLTR	576	1770.0	-	-	16	A	DS
Gayna River Reach 1	16	09/03/2007	51	51195	DVCH	288	230.0	F	02	7	A	DS
65° 17.464' N, 129° 21.481' W			52	51194	DVCH	224	130.0	M	06	4	J	DS
			53	51193	DVCH	208	90.0	M	06	4	J	DS
			54	2473	DVCH	302	-	-	-	-	-	LR
			55	2472	DVCH	250	-	-	-	-	-	LR
			56	2471	DVCH	263	-	-	-	-	-	LR
			57	2470	DVCH	267	-	-	-	-	-	LR
			58	2469	DVCH	240	-	-	-	-	-	LR
			59	2467	DVCH	222	-	-	-	-	-	LR
Gayna River Reach 2	17	09/03/2007	60	51191	BLTR	510	1340.0	F	01	11	-	DS
65° 17.861' N, 129° 21.376' W			61	-	ARGR	310	340.0	-	-	11	A	DS
			62	-	ARGR	234	140.0	-	-	5	A	DS
			63	-	ARGR	349	500.0	-	-	8	A	DS
			64	-	ARGR	228	130.0	-	-	5	A	DS
			65	-	ARGR	308	340.0	-	-	10	A	DS
			66	2466	ARGR	360	-	-	-	-	A	LR
			67	2465	ARGR	288	-	-	-	-	A	LR

Location	Site No.	Date M/D/Y	No.	Fish ID[1]	Species	FL (mm)	Wt (g)	Sex	Mat.[2]	Age (yr +)	Life Stage[3]	Fish Fate
Gayna River Reach 2			68	2464	ARGR	230	-	-	-	-	A	LR
(continued).			69	2463	ARGR	275	-	-	-	-	A	LR
			70	2462	ARGR	403	-	-	-	-	A	LR
			71	2461	ARGR	234	-	-	-	-	-	LR
			72	2460	ARGR	341	-	-	-	-	A	LR
			73	2459	ARGR	256	-	-	-	-	A	LR
			74	2458	ARGR	334	-	-	-	-	A	LR
			75	2457	ARGR	345	-	-	-	-	A	LR
			76	2456	ARGR	343	-	-	-	-	A	LR
			77	2455	ARGR	343	-	-	-	-	A	LR
			78	2454	ARGR	234	-	-	-	-	A	LR
			79	2453	ARGR	374	-	-	-	-	A	LR
			80	2452	ARGR	338	-	-	-	-	A	LR
			81	2476	ARGR	294	-	-	-	-	A	LR
			82	2477	ARGR	222	-	-	-	-	A	LR
			83	2478	ARGR	218	-	-	-	-	A	LR
			84	2480	ARGR	222	-	-	-	-	A	LR
			85	51196	DVCH	352	490.0	M	07	8	A	DS
Natla River (Ram Head Outfitters)	20	08/14/07	86	-	LKTR	492	-	-	-	-	-	LR
62° 00.268' N, 128° 59.680' W												
O'Grady Lake (Right Outlet)	21	08/14/07	87	-	ARGR	-	-	-	-	-	-	LR
62° 59.315' N, 129° 04.033' W			88	-	ARGR	370	-	-	-	-	-	LR
			89	-	ARGR	385	-	-	-	-	-	LR
			90	-	ARGR	345	-	-	-	-	-	LR
			91	-	ARGR	415	-	-	-	-	-	LR
O'Grady Lake (Left Outlet)	22	08/14/07	92	-	ARGR	-	-	-	-	-	-	LR
62° 59.791' N, 129° 03.676' W			93	-	ARGR	-	-	-	-	-	-	LR
			94	-	ARGR	-	-	-	-	-	-	LR

Location	Site No.	Date M/D/Y	No.	Fish ID[1]	Species	FL (mm)	Wt (g)	Sex	Mat.[2]	Age (yr +)	Life Stage[3]	Fish Fate
O'Grady Lake (Left Outlet)			95	-	ARGR	-	-	-	-	-	-	LR
(continued).			96	-	ARGR	340	-	-	-	-	A	LR
			97	-	ARGR	310	-	-	-	-	A	LR
			98	-	ARGR	280	-	-	-	-	A	LR
			99	-	ARGR	310	-	-	-	-	A	LR
			100	-	ARGR	380	-	-	-	-	A	LR
			101	-	ARGR	310	-	-	-	-	A	LR
			102	-	ARGR	350	-	-	-	-	A	LR
			103	-	ARGR	340	-	-	-	-	A	LR
			104	-	ARGR	350	-	-	-	-	A	LR
			105	-	LKTR	-	-	-	-	-	-	LR
O'Grady Lake (Upper) 62° 59.625' N, 129° 04.712' W	23	08/15/07	106	-	LKTR	450	-	-	-	-	-	LR
Natla River (Lower Outlet, O'Grady L)	24	08/16/07	107	-	ARGR	345	-	-	-	-	A	LR
63° 00.268' N, 128° 59.680' W			108	-	ARGR	375	-	-	-	-	A	LR
			109	-	ARGR	375	-	-	-	-	A	LR
			110	-	ARGR	356	-	-	-	-	A	LR
			111	-	ARGR	324	-	-	-	-	A	LR
			112	-	ARGR	360	-	-	-	-	A	LR
			113	-	ARGR	374	-	-	-	-	A	LR
			114	-	ARGR	355	-	-	-	-	A	LR
			115	-	ARGR	358	-	-	-	-	A	LR
			116	51181	BLTR	522	1390.0	F	05	13	A	DS
			117	51177	BLTR	405	660.0	M	06	9	-	DS
			118	51178	BLTR	688	3420.0	M	10	18	A	DS
			119	51179	BLTR	687	4050.0	M	10	15	A	DS
			120	51182	BLTR	785	5080.0	M	10	17	A	DS
			121	51175	BLTR	475	1430.0	M	06	8	-	DS
			122	51176	BLTR	424	890.0	-	-	9	-	DS

Location	Site No.	Date M/D/Y	No.	Fish ID[1]	Species	FL (mm)	Wt (g)	Sex	Mat.[2]	Age (yr +)	Life Stage[3]	Fish Fate
Natla River (Lower Outlet, O'Grady L)			123	8	BLTR	321	280.0	F	01	6	-	DS
(continued).			124	51180	BLTR	271	120.0	M	06	6	-	DS
			125	7	RNWH	370	620.0	-	-	-	-	DS

Table 8. Qualitative, quantitative, and genetic identification of char dead-sampled from the Mackenzie Mountains in 2007.
Notes: 1. LDF = linear discriminant function (Haas and McPhail 1991), 2. qualitative identification (ID) based on examination of external morphological features, 3. mitochondrial DNA, 4. growth hormone DNA, 5. ribosomal DNA.

Fish ID code	Location	Standard length (mm)	Upper jaw length (mm)	Anal Ray Count	Branchio-stegal Ray Count	LDF[1] score	Age (yr+)	Qualitative[2] ID	Mt[3] DNA ID	GH[4] DNA ID	rDNA[5] ID	Final ID
8	O'Grady Lake	297	39.2	10	26	1.2584	-	BLTR	BLTR	BLTR	BLTR	BLTR
51175	O'Grady Lake	432	65.2	9	24	0.5290	8	BLTR	BLTR	BLTR	BLTR	BLTR
51176	O'Grady Lake	385	60.4	9	24	0.7513	9	BLTR	BLTR	BLTR	BLTR	BLTR
51177	O'Grady Lake	367	55.6	10	28	3.2444	9	BLTR	BLTR	BLTR	BLTR	BLTR
51178	O'Grady Lake	623	108.5	10	25	2.2028	18	BLTR	BLTR	BLTR	BLTR	BLTR
51179	O'Grady Lake	628	100.3	11	27	3.0999	15	BLTR	BLTR	BLTR	BLTR	BLTR
51180	O'Grady Lake	244	35.0	9	25	0.8788	6	BLTR	BLTR	BLTR	BLTR	BLTR
51181	O'Grady Lake	471	66.0	9	26	1.3842	13	BLTR	BLTR	BLTR	BLTR	BLTR
51182	O'Grady Lake	704	114.4	10	25	1.7679	17	BLTR	BLTR	BLTR	BLTR	BLTR
51183	Carcajou River	412	60.5	9	27	2.2638	6	BLTR	BLTR	BLTR	BLTR	BLTR
51184	Carcajou River	444	66.4	9	26	1.7357	10	BLTR	BLTR	BLTR	BLTR	BLTR
51185	Carcajou River	491	76.6	10	26	2.1547	13	BLTR	BLTR	BLTR	BLTR	BLTR
51186	Little Keele River	517	79.8	10	27	2.7219	12	BLTR	BLTR	BLTR	BLTR	BLTR
51187	Carcajou River	527	83.8	10	27	2.8958	14	BLTR	BLTR	BLTR	BLTR	BLTR
51188	Tributary of Redstone R.	502	84.1	10	27	3.2135	16	BLTR	BLTR	BLTR	BLTR	BLTR
51189	Tributary of Redstone R.	517	85.9	9	26	2.3551	16	BLTR	BLTR	BLTR	BLTR	BLTR
51190	Trout Creek	488	76.0	10	25	1.5156	14	BLTR	BLTR	BLTR	BLTR	BLTR
51191	Gayna River - Reach 2	457	67.9	9	26	1.6994	11	BLTR	BLTR	BLTR	BLTR	BLTR
51192	Trout Creek	358	52.1	10	25	1.1348	9	BLTR	BLTR	BLTR	BLTR	BLTR
51193	Gayna River - Reach 1	188	16.1	11	20	-4.0668	4	DVCH	DVCH	DVCH	DVCH	DVCH
51194	Gayna River - Reach 1	201	22.7	10	22	-1.9684	4	DVCH	DVCH	DVCH	DVCH	DVCH
51195	Gayna River - Reach 1	261	29.8	10	22	-1.9221	7	DVCH	DVCH	DVCH	DVCH	DVCH
51196	Gayna River - Reach 2	316	51.6	10	21	-0.7186	8	DVCH	DVCH	DVCH	DVCH	DVCH

Table 9. Physical habitat characteristics of study locations where habitat use was measured during the summer 2007.
Notes: 1. Depth and velocities are mean values with ranges in parentheses, 2. Substrate and cover codes are described in methods, 3. Stream order is based on the Strahler system (Gallagher 1999) from a 1:50 000 scale map.

Location	Site (reach)	Latitude (N)	Longitude (W)	Stream order	Avg. wetted width (m)	Avg. temp (°C)	Month	DO (mg/L)	Elevation (m) (map scale 1:50 000)	Depth (range) cm	Velocity (range) m·s-1	Dominant substrate	Dominant cover
Smith Creek	1	63° 10.496'	123° 20.246'	4	5	13.3	August	10.0	450	25.0 (6.0-90.0)	0.25(0.01-0.9)	4	6
Smith Creek	2	63° 10.893'	123° 20.199'	4	7	10.2	August	9.8	500	28.2 (0.04-0.72)	0.18(0.01-0.93)	3	5
Hodgson Creek	3	63° 20.337'	123° 25.889'	2	3	9.6	August	10.9	1000	11.8 (2.0-28.0)	0.27(0.0-0.83)	3	6
White Sand Creek	4	63° 37.215'	123° 35.840'	4	6	9.9	August	10.9	1750	24.5 (0.06-1.18)	0.31(0.0-0.96)	4	6
Canyon Creek	5	65° 15.013'	126° 28.876'	3	4	7.1	August	12.2	600	11.0 (4.0-65)	0.24(0.01-0.75)	3	5
Canyon Creek	6	65° 15.219'	126°28.258'	3	4	6.1	August	12.6	700	10.7 (3.0-31.0)	0.31(0.01-0.92)	3	5
Jungle Ridge Creek	7	65° 02.887'	126°01.238'	2	5	10.5	August	10.6	400	22.6 (1.0-59.0)	0.13(0.01-0.65)	4	6
Gibson Creek	8	65° 41.989'	127°53.719'	2	3	6.0	August	-	350	44.2 (8.0-100.0)	0.11(0.01-0.45)	1	8
Little Keele River	12	64°42.566'	126°58.207'	4	-	7.2	September	11.2	1378	-	-	-	-
Gayna River	16	65°17.464'	129°21.481'	1	-	6.7	September	12.2	984	-	-	-	-
Gayna River	17	65°17.861'	129°21.376'	1	-	7.7	September	11.7	919	-	-	-	-
Elliot Creek	18	65°31.435'	127°37.123'	3	5	6.5	August	-	200	14.2 (3.0-56.0)	0.21(0.01-0.66)	3	5
Elliot Creek	19	65°31.357'	127°37.090'	3	5	-	August	-	200	15.2 (4.0-60.0)	0.20 (0.01-0.58)	3	5

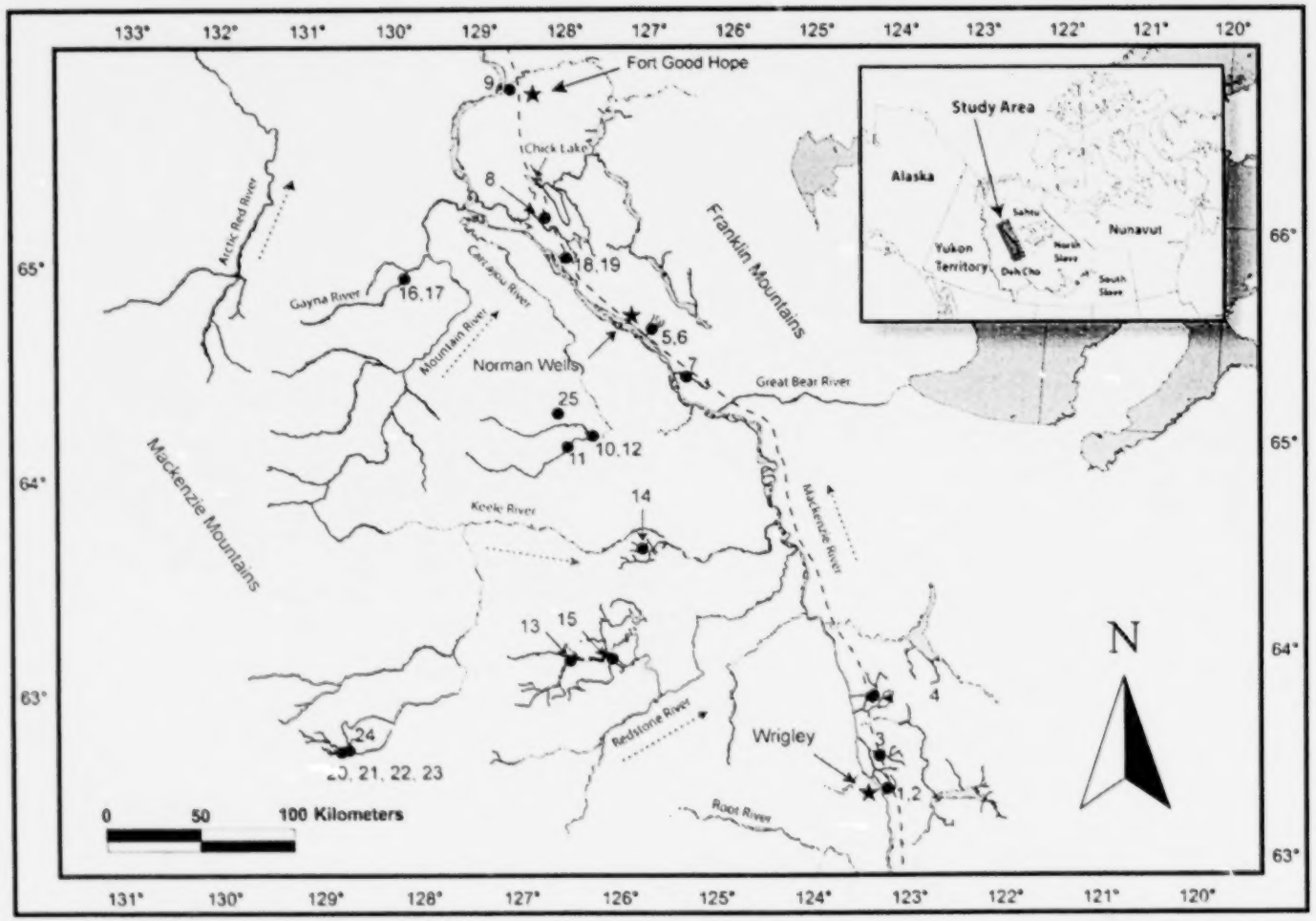

Figure 1. Sampling locations (circles) where stream surveys were completed in 2007. The dashed line shows the proposed Mackenzie Gas Pipeline route, dashed arrows indicate flow direction, and not all drainages are shown. Numbers correspond to survey locations which have data presented in tables.